National Infrastructure Advisory Council (NIAC)

Workforce Preparation, Education and Research Working Group

Final Report
April 11, 2006

Alfred R. Berkeley, III
Chairman and CEO
Pipeline Trading, LLC.

Dr. Linwood H. Rose
President
James Madison University

Agenda

- Question
- Approach
- Findings
- Recommendations

NIAC Question

- "**How do we ensure adequate development of intellectual capital to protect critical American information infrastructure and infrastructure concepts?"**
- Examined four areas to increase intellectual capital:
  1. Efficacy of the National Science Foundation's Scholarship for Service Program (Cyber Corps)
  2. Research and development priorities to improve cyber security
  3. Enhance the usefulness and availability of cyber security certification programs
  4. Improve math and science competency of K-12 learners

Approach (cont.)

- Why these areas?
  - Efficacy of Scholarship for Service (Cyber Corps) program
    - Government funded
    - Has a more immediate impact on workforce
  - Enhance cyber security research and development funding
    - R & D invigorates economy and infuses new knowledge into workforce
    - Drives innovation
  - Enhance the usefulness and availability of cyber security certification programs
    - Certification allows current workforce to gain new knowledge quickly
    - Strong method to update skills and learn new skills
  - Improve math and science competency of K-12 learners
    - Underlying key to a competent workforce, global competitiveness, innovation and protection of Nation's cyber security and critical infrastructure

Approach (cont.)

- Reviewed relevant research and available
- Interviewed subject matter experts from academia, government, the business world and the private sector

Findings

- Area #1: Efficacy of Scholarship for Service (Cyber Corps) program
  - The goal is to provide government with a qualified IA workforce
    - Managed by National Science Foundation (NSF)
    - In 2005, budget $14.2 million; 2006 budget request is $10 million
    - Over 600 students have received scholarships since Spring 2005
    - Recipients required to intern at and find permanent jobs at government agencies

Findings: Cyber Corps

- Challenges:
  - Locating an internship and job at a Federal agency
  - Lack of Cyber Corps awareness among agencies
  - Half of graduates end up at the National Security Agency, protecting information but not necessarily critical infrastructure
  - Financial considerations
  - Security clearances

Recommendations: Cyber Corps

1. Set up “draft” system (DoD has SFS program set up this way)
2. Provide hiring flexibility
3. Expand employment options
4. Restructure scholarship funding to be either Flat or Matching
5. Ease challenge of obtaining security clearances

Findings: Research & Development

- Area #2: Enhance cyber security research and development funding
  - The Study Group's research and interviews brought out seven key findings:
    - Research Agenda
    - Current Funding Status
    - Balanced Funding Portfolio
    - Adequacy of Funding
    - Time to Market
    - Talent Pool
    - Coordinating Body

Recommendations: Research and Development

1. Develop national research agenda to prioritize cyber security research efforts
2. Increase funding base for critical infrastructure protection and cyber security related research
3. Conduct additional studies to find solutions for decreasing cyber security research products' "time to market"
4. Ensure an adequate talent pool, increase and stabilize funding for fundamental research in unclassified cyber security
5. Designate coordinating body to oversee cyber security research efforts

Findings: Certification

- Area #3: Enhance the usefulness and availability of cyber security certification programs
  - Institute for Defense Analyses (IDA)
    - IDA conducted a study mapping Commercial IA Certifications to Pentagon IA Workforce Levels and Functions.
    - DHS has a goal to establish nationally recognized, privately administered certifications

Findings: Certification

- Challenges:
  - Making cross-government position attributes standard
  - Governance structure of a national information assurance (IA) certification program
  - Current testing methods may not adequately measure increases in Knowledge, Skills and Abilities (KSAs)

Recommendations: Certification

1. Develop and maintain standardized IA position descriptions, including required and recommended KSAs for each level of each Federal department and agency position
2. Designate a privately administered, public-private IA training certification body
3. Review and reform IA testing procedures, providing outcome-based, modular computer-based testing and metrics whenever possible

Findings: K-12

- Area #4: Improve math and science competency of K-12 learners
  - A globally competitive workforce is essential to any long-term protection of America's critical infrastructure and economy
  - Schools should teach facts, concepts and skills to make its workforce competitive in a global economy
  - The scientific method must be more rigorously applied to education

Findings: K-12

- Challenges
  - The Federal government cannot legally mandate curricula or teaching methods
    - Education is a mix of local, state and Federal decision making
- The Federal government can:
  - Provide existing research, comparisons, and analysis
  - Sponsor additional research in areas where rigorous, peer-reviewed, substantiated research is lacking
- The goal is to arm education decision-makers and parents, with information on what works and what doesn't to educate our children

Findings: K-12

- Standards: What Students Should Know at Each Grade Level
  - America's educational standards--local, state or Federal--must align with the realities of global competition
- Testing
  - Tests should measure whether a student knows what they are expected to know
- Curricula: What We Teach
  - State educational standards should be competitive with high performing international standards and their curricula should reflect those standards
  - Lacking curricula coherence
    - Teach a mile wide and an inch deep
    - Sequence is important
  - Leads to unintended social consequences

Findings: K-12

- Issues of Pedagogy: How Teachers Teach
  - Reading wars and Math wars
  - Teaching Aids: Textbooks
  - The Role of Automation in Teaching

Recommendations: K-12

1. The Federal government should do everything in its power to assist states in implementing internationally competitive standards, curricula and teaching methods.

Recommendations: K-12 (cont.)

2. To assist in this implementation, the Federal government should sponsor independent, third party peer reviewed research to:
   - Determine “high achieving” international competitors, be those competitors domestic or foreign
   - Determine the most effective international standards, curricula and teaching methods
   - Determine the strengths and weaknesses of the most internationally competitive curricula and teaching methods
   - Compare each state’s educational standards to the standards, curricula and teaching methods of the high achieving international competitors

Recommendations: K-12 (cont.)

- Compare the most widely used U.S. curricula for each subject against the curricula of high achieving nations in those same subjects
- Compare each state's curricula sequencing and coherence against the curricula sequencing and coherence of the highest performing states and international competitors
- Test U.S. students against the most competitive international standards using the National Assessment of Educational Progress
- Develop low-risk self-tests covering internationally competitive K-12 curricula
- Compare the effectiveness of "self-discovery" and "basic skills" approaches to teaching

Recommendations: K-12 (cont.)

- Determine whether approved textbooks have been independently peer-reviewed by subject matter experts in the disciplines involved in the books
- Determine whether the curricula and teaching methods taught in teacher certification programs are substantiated as globally competitive by independent, third-party, peer-reviewed research
- Determine whether each state's curricula used in compliance with No Child Left Behind have a basis for effectiveness substantiated by research
- Publish the results of all research relevant to the topics listed above on the Internet to make them widely available to educators and parents

Recommendations: K-12 (cont.)

- All research initiated as a result of these recommendations, including research on Project Follow Through and the Trends in International Mathematics and Science Study (TIMSS) should be published and made publicly available via the Internet
- Accountability mechanisms, including Federal funding incentives, should be implemented to encourage States, school districts and teacher preparation programs to achieve internationally competitive standards, curricula and teaching methods

Discussion

- Questions?